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### Prioritizing marketing research in virtual reality

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## **Prioritizing Marketing Research in Virtual Reality: Development of an Immersion/Fantasy Typology**

### **Abstract**

**Purpose:** Virtual reality (VR) is of increasing interest to marketers because it can be used to explore and proactively shape long-term futures, co-create value with consumers, and foster consumer-brand engagement. Yet, to date, the field lacks a cohesive framework for approaching VR research; thus, the objective of this systematic literature review is to provide such a framework and highlight research opportunities.

**Approach:** First, after conducting a systematic literature review, we highlight VR themes instrumental to flow and propose a typology for VR research using realism-fantasy and immersion as dimensions. Next, we review the current state of empirical research for each quadrant. Finally, we synthesize research within each quadrant, specifying criteria and considerations for conducting research. In doing so, we propose an agenda for marketing research, centered on methodological, future studies, and consumer-related contributions.

**Findings:** VR themes instrumental to flow include the avatar, application quality, and interactivity. We find, contrary to some conceptualizations of VR, that all applications are capable of producing flow. Conflicting research and gaps are highlighted in the findings section and summarized in Table 3. Additionally, while prior research seems to draw from findings of other VR applications in advancing knowledge in general, the results of the literature review suggest that VR applications should be treated uniquely. Finally, we propose highly immersive VR applications as more conducive to future studies research.

**Originality/value:** The objective of this paper is to examine varying opportunities for VR research given flow and fantasy potential and to prioritize VR research.

**Keywords:** future studies; flow theory; immersion; realism-fantasy; virtual reality

## **Prioritizing Marketing Research in Virtual Reality: Development of an Immersion/Fantasy Typology**

### **Introduction**

Virtual reality (VR), an immersive computing technology, absorbs users in a responsive virtual world (Berg and Vance, 2016), making the individual feel that the experience is real. As a result of immersion, focus on the virtual environment (VE), and forgetting the real world (Csikszentmihalyi, 1997), VR enables flow (Faiola et al., 2013; Matthews, 2015). In fact, flow explains why consumers experience learning, favorable attitudes, and increased purchasing in VEs (Animesh et al., 2011; Failoa et al. 2013), making VR a novel tool to co-create brand experiences and research consumers.

Marketers have used VR since the 1990s in the form of computer-simulated environments with 3D modeling to predict market share and price sensitivity (Burke, 1996). Recently, VR has helped marketers obtain customers, build relationships, and create excitement (Ali and Frew; 2014; Li and Buchtal, 2012). For example, Lowe's (2018) introduced the Holoroom (in participating stores), which utilizes smartphone-compatible headsets to guide customers through home improvement lessons. Likewise, Topshop offers an immersive VR experience that blends a real slide with a virtual waterslide (Romeo, 2017). Academically, recent research efforts have begun to use more sophisticated techniques, such as eye tracking and choice simulations for complex problems (Glazer, 2012). Though VR has been broadly applied in various domains (Fox et al., 2009), including psychology (Washburn, 2003; Young, 2010), ethics (Cram et al., 2011), economics (Innocenti, 2017), and neuroscience (Parsons, 2015), much remains to be understood regarding how to use VR, what to expect from different VR applications, and what areas of VR need further investigation.

Given the advantages of using VR to understand consumers and predict real-world behavior (Loomis et al., 1999; Meißner et al., 2017) it is surprising that marketers' use of VR remains sparse (Eye Faster, 2017). Thus, how can marketing scholars apply VR to extend the boundaries of knowledge in more realistic and technologically advanced ways? In marketing – especially consumer behavior – the increasing need for targeted behavioral tracking, expanding analytical capabilities in discipline, and believability concerns of traditional research techniques furnish promising opportunities for VR applications. These opportunities exist not only for advancing theory by using VR as a context or understanding consumers but also for exploring future studies and predicting technological change (Wind, 2014).

VR provides a unique avenue to investigate future studies in marketing relating to systematic and explicit thinking about alternatives that can help navigate the future (Bell, 2003). By 2045, futurists predict that we will experience the point of singularity: the emergence of rapid technological growth without understanding the associated ramifications, which will likely impact multiple aspects of life, including the economy, science, and society (Bell, 2003; Kurzweil, 2005). Kurzweil (2005) argues that this point is already arriving: “[b]y the end of this decade, computers will disappear as distinct physical objects, with displays built in our eyeglasses, and electronics woven in our clothing, providing full-immersion visual virtual reality,” (p. 143). Though written in 2005, Kurzweil's predictions are coming to fruition. Many people use VR to interact with real and animated others, and for some, VR *is* reality. This will become even truer for larger society, as Kurzweil suggests that VR will expand extensively in the 2020s – work will occur in VR, and VR will be capable of fulfilling all our desires, perhaps even giving us options never before conceived. To date, we can see evidence of this shift, with universities holding virtual classes (Halvorson et al., 2011).

It is for these reasons outlined – namely, marketers' use of VR despite the lack of academic research, widespread use of VR by consumers and its impact on lifestyles, and

shifts in technology coupled with the need to understand these shifts through future studies research – that VR provides ample opportunities for marketing scholarship. Specifically, in this vein, VR provides benefits over traditional methods (e.g., lab experiments, convenience sample surveys, localized focus groups) and can promote new ways of thinking about and examining consumption, society, and marketing (Saren et al., 2013). Compared to 2D environments, VR permits more control, transports users to new experiences, incorporates sensory elements, and elicits telepresence, the feeling of being in another world. Generally, VR can investigate alternative realities, new product ideas, or simulated scenarios; moreover, VR continues to advance the potential of research designs (Berg and Vance, 2016).

Because VR applications differ in realism (Dholakia and Reyes, 2013) and immersion (Nah et al., 2011), a framework is needed for understanding how VR can be used to address marketing-related research, especially given that such a framework does not currently exist. Thus, the first goal of this paper is to identify VR applications, creating a typology for marketing research using dimensions of realism and immersion. This framework is rooted in flow theory given the role of immersion in VR (Csikszentmihalyi, 1997). Second, through a systematic VR literature review, we aim to elucidate differences across VR applications and how each contributes to flow. Third, we provide evidence of the lack of marketing research in VR and provide summaries on the current states of research in each quadrant, conflicting or unique findings, and literature gaps. Finally, in exploring the flow potential within each quadrant, we offer the following contributions for researchers employing VR applications: operationalizations, considerations, advantages and disadvantages, and amenability for future studies. The review culminates with a research agenda to inspire VR marketing research.

## **Definition of VR**

Evolving from the video game industry (Gutierrez et al., 2008; Vince, 2004), VR involves a simulated VE created or mediated by computing technology with which a user

interacts (Harrison et al., 2011). Guttentag (2010) defines VR as the employment of computer technologies to create perceptions of a 3DVE (from 2D imagery) that affords navigation and interaction, leading to sensory activation along one or more modalities. This latter definition synthesizes prior definitions by tapping into several aspects important to VR – visualization of, immersion into, and interaction with the VE (Wilson et al., 2002) – and places emphasis on movement in and manipulation of objects in VEs (i.e., Gutierrez et al., 2008; Vince, 2004). Contrary to some arguments (c.f., Gutiérrez et al., 2008; Vince, 2004), Guttentag (2010) suggests that VR immersion can exist at low levels, which we support and elaborate in the findings section.

Aside from VR's ability to gather data non-invasively using traditional techniques, such as experiments and observations (Yee and Bailenson, 2008), VR uniquely incorporates spatial environments (Vince, 2004), providing real-world, real-time representation of cognitive and affective processing (Loomis et al., 1999; Parsons, 2015). Moreover, VR can incorporate social cues from real or computer-simulated avatars (Parsons et al., 2017), mimicking real-world responses (Young, 2010) as a result of seeing (vs. reading) a scenario. Further, VR reduces non-representative sampling bias (e.g., no location constraints) and can examine unthinkable, untestable yet expertly controlled scenarios (Biocca and Delaney, 1995). For example, one study using VR testing helped reduce crowding in tourist sites (Gimblett et al., 2001).

#### *Future Studies: A Foundation for VR*

In their editorial, Saren et al. (2013) argue that VR can be used to explore future technologies (nanotechnology, holographics, haptic devices, etc.) and ascertain how consumers may react to and adopt technology within the sphere of social and economic influence. Imagine a world where social networking requires a virtual headset and dialogue

occurs virtually; this is predicted to occur in the next eleven years (Fox et al., 2009; Kurzweil 2005). Given that technological changes will create unprecedented economic, scientific, and social shifts, it is important to understand the effect of these shifts on consumers (Bell, 2003). For instance, Cowen (2013) argues that American society will experience an increasingly bimodal distribution of wealth and economic returns, with fewer mid-level jobs, leaving society unprepared for this income gap. If these shifts, though, can be recognized with future studies, as suggested by Kostyk and Hyman (2015), then society could address changing needs and modify technology to anticipate effects.

Additionally, for marketers, it is important to understand the ramifications of technology to predict and understand consumer needs in the future (Van der Duin, 2016), including how firms cater to consumers (Wind, 2014), analyze uncertainties (Gonzales, 1992; Moutinho et al., 2014), lessen risk (Hines and Bishop 2006), prepare for new roles and structures of society, and examine the widespread impact on businesses and decision-making processes (Moutinho et al., 2014). While marketing research has largely ignored future studies approaches (Cowen, 2013), firms engaged in future studies have experienced greater profitability and growth (Kim, 2017). As another benefit, VR provides a relevant lens to explore future studies as well as to better understand consumer behavior in today's environment (Kozlov and Johansen, 2010; Schonbrodt and Asendorpf, 2011). However, the type of VR can affect the transferability of VR findings to the real world in that not all VR results are realistic (Grinberg et al., 2014; Mazursky and Vinitzky, 2005); thus, VR applications may differ in relevancy for future studies research. Therefore, it is critical to understand VR application differences such as topics best suited for different applications, flow considerations, and miscellaneous factors. However, first, we systematically review the VR literature.

## Methodology

Following a systematic review protocol (Tranfield et al., 2003), we analyzed the literature that has empirically examined VR to provide a foundation for our proposed typology and delineate the current state of research within the typology. Such a systematic review ensured that important works were included and that the state of VR knowledge was accurately represented. We utilized Scopus, EBSCO, and ProQuest online databases to locate articles published in the last 15 years (2003 to 2018) using combinations of the following keywords: “virtual reality,” “immersion,” “immersivity,” “flow,” “realism,” “fantasy,” “simulation,” “virtual environment,” “AVE,” “CAVE,” “head mounted display,” “HMD,” and “virtual world.”

The search process yielded a set of approximately 1,500 citations, which were downloaded into Excel and sorted to delete duplicates, non-peer-reviewed journals (chapters, conference proceedings, etc.), and articles in non-English languages. Next, we individually assessed the relevancy of the topic to the goals of the paper by reviewing the titles, keywords, and abstracts of each article. Because VR spans several disciplines, this search resulted in several studies with discipline-specific findings irrelevant to marketing (e.g., medical or manufacturing-related). After excluding these, 188 articles remained. Removing conceptual articles left 129. We also noted whether each article was published in a marketing-related publication and the empirical methodology used, providing these results below in Table 1.

*Insert Table 1 Here*

Next, PDFs of each article in the final dataset were downloaded, read, and coded to develop a concept matrix supported by the literature (Braun and Clarke, 2006). Specifically, we coded the articles as to the VR class examined (automated virtual environment, simulation, virtual world, or mixed) with sub-codes by specific application (head-mounted



display, game, social virtual world, etc.). Codes were also created for the empirical strategy (e.g. netnography, experiment), independent and dependent variables, and theoretical foundation (if appropriate). Disagreements in coding were resolved through discussion. The articles with a theoretical framework most commonly used flow theory: the review revealed common patterns related to flow, important attributes that produce flow, and the outcomes of flow. Figure 1, representing these themes, is included below. We next discuss flow theory and its relationship with VR.

*Insert Figure 1 Here*

### **Findings: VR and Flow Theory**

Flow theory argues that individuals can enter a cognitive state in which they become completely immersed, with higher alertness, concentration, involvement, agency, and intrinsic rewards (Nakamura and Csikszentmihályi, 2001). A fundamental component of flow, immersion, is the degree to which an individual becomes engrossed in VR apart from reality, such that users' senses and thoughts are dominated by the VE (Guttentag, 2010; Harrison et al., 2010) and deem the real world unimportant (Biocca and Levy, 1995). After reviewing the literature, we found several themes evocative of flow, including the avatar, interactivity, and application quality (see Figure 1). Importantly, each theme uniquely contributes to the flow state individuals experience within each VR application.

Flow theory suggests that greater immersion may be required for fantastical locations (e.g., a land of dinosaurs, the moon) to achieve a high degree of realism that transfers to the real world (e.g., *Jurassic Park*, *Avatar*; Innocenti, 2017). Therefore, for virtual worlds (VWs), the interactivity from social connections enables fantastical VEs to be capable of creating flow states (Animesh et al., 2011; Grinberg et al., 2014). For automated virtual environments (AVEs), high immersion is experienced, largely due to the application quality (Cummings and

Bailenson, 2015). Although fantasy-related experiences are technically possible in AVEs, they remain unexamined. In fact, realism was expressed often as a theme (e.g. Banos et al., 2008; Guegan et al., 2017; Valtchanov et al., 2010).

Despite variations in immersion-eliciting states available, some researchers argue that only high immersion can create flow (Csikszentmihaly, 1997; Huang et al., 2013). However, our systematic literature review reveals that all VR applications can produce flow states, though all may not be highly immersive. In low immersion states, users feel more connected to the real world (Gutiérrez et al., 2008), which occurs in simulations. Simulations include product simulations, game simulations, 3D websites, and location simulations. Since game simulations tend to exhibit more potential for fantasy, different criteria for immersion, and particular methodological considerations, game simulations were kept as a unique quadrant. For instance, for simulations (vs. games), realism is critical to the experience and to flow, triggered by all three themes (Poeschl and Doering, 2011), and telepresence moderates the relationship between realism and flow (Krasnikolakis et al., 2018). Games elicit flow states from the avatar (Christy and Fox; 2016; Przyblyski et al., 2012), and user motivations in games stem from fantasy and need for play (Molesworth, 2006).

Based on the findings of the literature review and the role of flow in VR, a typology clearly emerged from the analysis. First, VR applications vary in their immersion levels (e.g. Guttentag, 2010), with AVEs and VWs offering considerably higher immersion than simulations and games. Second, the use of realism versus fantasy differs across applications (e.g. Schultze and Rennecker, 2007) – AVEs and simulations integrate higher levels of realism, whereas VWs and games focus more on fantasy experiences. Thus, we classify VEs into varying levels of immersion and realism (real or fantasy) to form a typology of VR applications. We then present research questions to prioritize VR scholarship within each,

presented below in Figure 2. Table 2 below also summarizes the research findings for each quadrant presented in the findings section, next.

*Insert Figure 2 Here*

*Insert Table 2 Here*

## **Result from Findings: VR Immersion/Realism Typology Prompting Research Questions**

### *Quadrant I: Automated Virtual Environments (AVEs)*

AVEs promote user control and simulation and integrate the five senses. Users experience the environment as real, can walk around the VE, and engage with objects (Gutierrez et al., 2008). As an expression of application quality, heightened sensory stimulation and congruency with the VE enables flow (Cummings and Bailenson, 2015; Guttentag, 2010). AVEs include Cave Automatic VEs (CAVEs) and head-mounted displays (HMDs; Loomis et al., 1999). CAVEs involve stationary display surfaces from multiple projectors and surround sound from loudspeakers; this design integrates perspectives and manipulation. Like CAVEs, HMDs change position, orientation, visual stimuli, and auditory stimuli with user movements but have reduced field of vision and interactivity (Meißner *et al.*, 2017). Comparisons of HMDs and CAVEs reveal no differences in flow though HMDs allow a limited view of one's own avatar (Vinayagamoorthy et al., 2006; Waltemate et al., 2009).

Consistent with Fox et al. (2009), the results of the systematic literature review reveal an emphasis of research on application quality. Marketing-related studies were few, though these demonstrate that task complexity can influence brand attitudes and product choice, thus making them generalizable to the real-world (Bigne et al., 2016; Dobrowloski et al., 2014). Thus, initial research shows promise in AVEs to study marketing phenomenon beyond other VR applications. For instance, compared to simulations, AVEs increase task performance, telepresence, navigation ability, and learning (Slobounov et al., 2015), and results are more

ecologically valid (Macedonio et al., 2007). Similarly, interactions with others (human avatars and others' avatars) reflect real world patterns, such as the bystander effect (Kozlov and Johansen, 2010) or discrimination (Tremblay et al., 2016). We next discuss themes of application quality, interactivity, and avatars.

*Application Quality.* In a meta-analysis, Cummings and Bailenson (2015) found that application quality features influence immersion in AVEs and telepresence, especially the following features: tracking level (naturalness of movements, ability to act on the VE, etc.), stereoscopy (e.g., depth of perception), and user perspective (Alshaer et al., 2017; Cummings and Bailenson, 2015). However, the effects of user perspective and even update rate may be unreliable as very few prior studies have investigated these features. Sensory input moderates the application quality-flow relationship, in which sensory incongruence with the VE diminishes task performance (Calogiuri et al., 2018; Chirico et al., 2018). However, these studies relied heavily on sound and visual cues, so more information is needed to assess how sensory features such as haptic and olfactory cues influence flow states.

Furthering the notion of realism, research finds that emotion-inducing AVEs increase flow, and vice-versa (Banos et al., 2004, 2008). In fact, much research concentrates on the role of the AVE (VE quality) in piquing emotions, thereby influencing telepresence and individual responses. One study finds that AVEs involving nature can serve as surrogates for nature itself (Valtchanov et al., 2010) and trigger the same emotions of the environment (e.g., relaxation while walking through a wooded area; Calogiuri et al., 2018; Chirico et al., 2018). When AVEs prime emotions in user experiences, emotions override the lack of application quality, such as stereoscopy, in contributing to telepresence and flow (Banos et al., 2008). Yet, few application quality factors were explored with emotions.

*Interactivity.* Within AVEs, very little research examines interactive factors, probably because AVEs by nature are highly interactive. Of the studies that do investigate interactivity,

they consider body movements and avatar interactivity. Interestingly, Renaud et al. (2003) find that body movements (i.e., head rotation and eye gaze) represent VE interactivity, promote flow, and can be used as an operationalization of telepresence. That is, flow is created from a multi-step process of interaction over time with the AVE, where the user accepts the environment as real. Then, while interacting and engaging with the VE, they imagine the mediated environment and finally accept it as real; alignment of the imagination with the AVE accelerates flow (Cummings and Bailenson, 2015). Aside from the aforementioned studies, most interactivity research occurred within the framework of avatars.

*The Avatar.* Even though individuals have a limited view of themselves in AVEs (and no view in CAVEs), avatar representation can enhance flow and interaction quality with others, where more realistic and real-world-consistent interaction patterns occur when avatars are more realistic-looking (Bailey et al., 2009). Further, increased avatar personalization increases body ownership (Waltemate et al., 2009), though realistic avatars can also make individuals more self-conscious and lead to negative self-thoughts (Mountford et al., 2016). Therefore, the avatar representation is important in interactions with others, perceptions of realism within the VE, and even feelings toward the self.

### *Quadrant II: Simulations*

Simulations, defined as virtual interactions with virtual objects (e.g., viewing and evaluating) in VEs, enable object rotation, zooming, and virtual use, which can improve learning and satisfaction, diagnosticity, and brand-user relationships (Algharabat and Dennis, 2010; Papagiannidis et al., 2013). Authenticity in simulations increases hedonic value and even consumers' desire to purchase the product (Algharabat and Dennis, 2010). Although the virtual version of a product receives less positive comments than its real-world counterpart (Soderman, 2005), the virtual (versus real and sketched) version results in greater knowledge,

cognitive and affective product imagery, telepresence, and purchase intentions (Daugherty et al., 2008; Hyun et al., 2012).

3D simulations provide ecological validity (Banos et al., 2004), as evidenced through assessments in 3D versus 2D VEs (Fiore et al., 2009). Jiang and Benbasat (2005) classified online simulations as visually (e.g., move, rotate, and zoom) and functionally (e.g., testing and functioning in more sophisticated VE) diagnostic. At the most basic level, individuals interact with objects through keyboards, joysticks, and perspective (Fox et al., 2009). For example, home improvement websites employ 360-views and life-like trials. However, more complicated devices, including haptic gloves, voice recognition software, and wands, enhance functionality and interactivity (Gutiérrez et al., 2008; Vince, 2004). Notably, several articles on simulations come from marketing-related business journals, most likely because the simulation context is relevant for store design and product simulations in e-tailing. These studies reveal that realism from all three themes from Figure 1 (avatar, application quality, and interactivity) determines the extent of immersion and flow (Poeschl and Doering, 2011). However, as substitutes for one another, the platforms must be balanced – high levels of immersion across all three types can thwart the effectiveness of the application (Bhatt, 2004).

*Application Quality.* Research has concentrated heavily on the VE, concerned with audience presence, scene realism, and even factors outside of what Poeschl and Doering (2011) identified as relevant in constructing realism, including the functionality of the simulation (Tan et al., 2013; Wallet et al., 2011). Even the screen size impacts cognitive efficiency (Tan et al., 2013). Based on what Poeschl and Doering (2011) termed scene realism, satisfaction (i.e., a comparison of expectations and reality) and enjoyment with the simulation environment determine simulation effectiveness. More expected scenarios increase purchase intentions and flow, with telepresence moderating these effects (Kim et al., 2014; Krasonikolakis et al., 2018). Therefore, the quality must be sufficiently high to make the VE

appear real. More realistic environments increase navigation ease and task accuracy and even time spent in the simulation (Meijer et al., 2009), even with only low levels of immersion (Smolenstev et al., 2017). Vividness and detail increase the simulation experience, especially when users are more task-oriented (Wallet et al., 2011). Future research should build on the work of Poeschl and Doering (2011) to contribute to simulation realism.

Conflicting evidence exists as to whether emotional intensity can increase engagement and realism of the simulation (Banos et al., 2004; Kim et al., 2014). Still, even given a realistic simulated environment, consumers may not always make decisions consistent with their prior preferences (Mazurksky and Vinitzky, 2005), and researchers should acknowledge this limitation. Further, flow stemming from application quality can be moderated by individual differences. For example, although searching versus browsing goals do not influence attitudes or purchase intentions in simulations (Schlosser, 2003), details in the VE can positively influence those who have search goals (Wallet et al., 2011). Also, simulations that appeal to promotion-focused consumers result in more efficiency and satisfaction, especially in high involvement (Sun et al., 2011).

*Interactivity.* More interactivity increases attitudes and purchase intentions because of mental imagery (Schlosser, 2003). Although visual control increases effectiveness of diagnosing appearance-related factors, functional control increases functionality-related and even appearance-related diagnosticity in the absence of visual control (Jiang and Benbasat, 2005). When testing a virtual mirror (vs. 360 simulation and photo image), consumers experienced an increase in mental tangibility, physical tangibility, diagnosticity, and purchase intentions (Verhagen et al., 2016). Still, this was not the result of platform interactivity but was based on liking of the photo, such that the experience was interactive because it was co-created.

According to Bhatt (2004), service providers should provide less immersive, realistic detail and higher interaction through website design and connectivity with others. However, too much interaction can decrease the effectiveness of a simulation when high immersion stems from emotions (Banos et al., 2004). Likewise, interaction with others can increase cognitive load, except when simulations are more static (vs. immersive; Van der Land et al., 2010). Still, little is known about how interactivity level within realistic (versus non-realistic) environments informs brand evaluations and product responses.

*The Avatar.* As with real-world environments, the presence of others influences behavior in a simulation, even when those others are computer-generated (Poeschl and Doering, 2011; Silva et al., 2015). Social connectivity can decrease dissonance and increase satisfaction, especially for consumers with high brand trust (Liao, 2017). Very few papers, though, test the effects of others in the environment, and as such, there is a lack of knowledge of how others influence actions and perceptions within simulations. The avatar research complements that of AVEs, so none of the research overlaps. The findings indicate that avatar field of vision increases task performance, contributing to telepresence and thus flow (Alshaer et al., 2017). For the individual avatar, the self is localized in the simulation through avatar choice, bridging the virtual and real worlds (Wissmath et al., 2011). Once again, realism is critical for flow. Realistic and similar avatar faces and bodies increase user identification, boosting emotional attachment and intentions to use the avatar again (Sun et al., 2016). However, individuals prefer avatars with their ideal (vs. actual) weights, which influences their pursuit of long-term goals and their short-term behavior (Kuo et al., 2016).

### *Quadrant III: Virtual Worlds*

VWs consist of computer-simulated spatial environments supporting communications among users via avatars (Schultze and Rennecker, 2007). The networks of users have avatars



in either social virtual worlds (SVWs), like Second Life, or Massively Multiplayer Online Role-Playing Games (MMORPGs), like World of Warcraft. Avatars relate to each other, motivated by play, creativity, and ritual (Boellstorff et al., 2012). Different from other VR applications, VWs have persistence. That is, they do not cease to exist when the user logs off but continue to evolve (Banakou et al., 2009). Moreover, VWs offer a continuum of progression to emergence – MMORPGs tend to have more progression since the game is scripted, while SVWs provide more emergence through natural interactions.

*Application Quality.* VWs may offer varying degrees of fantasy and reality since VWs are more fantastical than other types of VR (Schultze and Rennecker, 2007). Further, as the most extensive form of VR (Harrison et al., 2011), VWs incorporate games and challenges, making them entertaining, involving, and arousing, all of which increase immersion per flow theory (Roussou, 2004). However, skill and user challenges experienced by the quest or interactivity should be balanced to optimize flow (Domina et al., 2012). Much research on VWs investigates immersion and flow given the high interactivity and flow experienced in VWs such as Second Life (Faiola et al., 2013), failing to account for feature quality. Tourism, for instance, has benefited greatly by innovating tourism management in VWs (Ali and Frew, 2014). Given that more efforts are being made toward enhancing the feature quality of VWs (Gadalla et al., 2013), more research is needed to explore this gap.

*Interactivity.* Interactivity drives enjoyment (Animesh et al., 2011) but can also depend on the motivations users have for joining the VW (Whang and Chang, 2004). Given the nature of the VW, all users are agents in the production of the experience, including shopping in virtual stores and brand storytelling. By nature of the world, the co-creation of stories in VWs serves as a backdrop within the entertainment and fantasy that motivate participation. Partly driven by fantasy, emotions, and contact with others, co-creation activities in VWs influence service quality perceptions (Gadalla et al., 2013). Users can share their imaginations to

enhance the VW (Boulaire et al., 2008), promote self-expression, achieve identity, and attain social goals (Gadalla et al., 2013). However, co-creation efforts are different from findings of prior literature; they resemble lead users and brainstorming sessions in which more information is gathered as a team and all efforts are considered. The more hedonic the co-creation process, the easier it is to attract and engage participants (Kohler et al., 2011).

Users also experience interactivity through engagement with each other (i.e., social connections). While both spatial exploration and social connections increase engagement and immersion (Grinberg et al., 2014), social connection is the key to immersion, where social telepresence increases experience of place (Saunders et al., 2015). The type of language exchanged (e.g., positive vs. negative) affects communication and community (Wu and Kraemer, 2017), with more positive interactions explaining reciprocity, commitment, and behavioral change (Chan and Li, 2010), especially when users have shared values (Wu et al., 2010). Yet, conflicts arise as to how realistic the social experiences are in VWs (e.g., Grinberg et al., 2014; Schonbrodt and Asendorpf, 2011). The research suggesting realism argues that these interactions can foster learning and aid in the development of problem-solving skills, which is why medical and manufacturing industries use VWs to improve processes and train employees (c.f., Cram et al., 2011). However, the impact of interactions on trust is not clear as evidenced by conflicting results (e.g., Friend and Hamilton, 2016; Goel and Prokopec, 2009).

*The Avatar.* Avatar appearance reflects a rational choice to represent oneself in a virtual manner, one degree of the manifestation of self-concept in VWs (Berthon et al., 2010). Further, multiple studies indicate that avatar representation can be used to prime certain behaviors, such as a long-term mindset (e.g. Hershfield et al., 2011) and emotions (Pena et al., 2009). Other papers examine avatars as virtual advisors within VW shops, represented by humans and/or computers. Virtual advisors are more credible when their dialogue is in textual

(versus auditory) form (Jin, 2009). However, consumers can be skeptical of virtual advisors when they have privacy concerns or little product knowledge or the firm is perceived to have profit goals (Guo and Barnes, 2009; Li and Buchthal, 2012). Ideally, as another opportunity for interaction in a VW, virtual advisors should customize their responses, provide solutions, and lead to value (Li and Buchthal, 2012). Unfortunately, observations indicate that very few brands in VWs have installed virtual advisors efficiently (Mackenzie et al., 2009).

Additionally, users can purchase virtual or physical products in VWs, which reflects an extension of the avatar and, by proxy, extension of the self (Guo and Barnes, 2009). Virtual consumption tends to be motivated by VW enjoyment and the connection between the real and the virtual world, such that items blur this line. Moreover, even virtual purchases hold real value (Domina et al., 2012; Kim, 2012) and are anteceded by perceived value (Kim, 2012), usefulness, network size, availability (Mantymaki and Salo, 2013), and telepresence (Nah et al., 2011). Brands can appeal to users in VWs, as these users look for virtual offers and unique items, where shop navigation is easy (Gadalla et al., 2013). Oddly, despite increased telepresence and purchase intentions in 3DVWs, 2DVWs engender better brand equity (Nah et al., 2011), leaving much more to understand from a brand perspective in VWs.

#### *Quadrant IV: Games*

As an extension of simulations, Quadrant IV consists of 3D gamified simulations, such as advergames, computer games, and mobile games. Compared to the other quadrants, Quadrant IV is represented by very little research. These games can reproduce the same results as AVEs, such as the bystander effect (Kozlov and Johansen, 2010), but they do not elicit the same emotions, even for experienced gamers, which creates more ideal training scenarios (Toet et al., 2009). Game players are motivated to participate in games for two reasons, which may enhance or dilute the effectiveness of brand communications in these

games. Half seek brand placement to engage in imaginary consumption of products and brands, and the other half dislike brand placement, suggesting that placements detract from the fantasy. Still, for both groups, game use offers fantasy (Molesworth, 2006).

*Application Quality.* Some research examining game play factors suggests that the type of feedback in the game influences brand personality. For example, more haptic feedback (e.g., vibrations) increases perceptions of ruggedness (Jin, 2010b). Additionally, in-game advertising also affects behaviors, such that when exposed to anti-DUI advertising in a game, participants reported reduced attitudes toward drinking and driving (Burrows and Blanton, 2016). When the game is incongruent with expectations, quality features matter more than interactivity in eliciting telepresence (Vashisht and Chauhan, 2017).

*Interactivity.* For training, games can be used to set and promote goal achievement (Ahn et al., 2016), and prevention goals can be more helpful for those who are more interdependent (Jin, 2010a). Game training and/or prior video game experience can enhance the effectiveness of simulations in task performance and behavioral change (Sturz et al., 2009) because skill increases flow (Matthews, 2015). Likewise, interactivity improves immersion and flow when the game theme is congruent with the advergame brand (e.g., skateboarding brand and skateboarding-themed games; Vashisht and Chauhan, 2017).

*The Avatar.* Immersion is ultimately underscored by avatar choice, where avatar identification increases immersion and telepresence (Przybylski et al., 2012), especially for individuals with higher interdependence tendencies (Jin and Park, 2009) or when the avatar represents a player's ideal self (Przybylski et al., 2012). Although telepresence resulting from avatar choice does not impact social telepresence (Christy and Fox, 2016), players experience higher flow, telepresence, and enjoyment when playing with real others than with a computer avatar (Weibel et al., 2008). Further, avatar identification increases motivations to play

(Przybylski et al., 2012). For these reasons, avatar choice affects enjoyment, a necessary component in triggering flow and telepresence (Weibel et al., 2008).

### *VR Application Use in Marketing Research*

The results support our initial assertion that marketers have yet to take full advantage of VR applications in research. Our literature review contributes to VR methodological research by drawing literature from different domains, highlighting research considerations within each VR application, and signaling each's advantages and disadvantages. Still, some of this research, especially concerning avatars, assumes all VR applications are comparable. This may or may not be true; however, more research is needed to explore this assumption and to further marketing research within each of the four quadrants.

Given that all four quadrants hold promise in different regards for marketing research, we provide a more comprehensive list of potential future marketing research, shown in Tables 3 and 4 below. First, Table 3 details the methodological considerations, gaps, and conflicts within each quadrant, resulting from the systematic literature review. Table 3 should be used by marketers to evaluate the varying considerations in order to select the VR application most appropriate for the research objective as well as to address the research gaps and reconcile conflicting accounts. Further, Table 4 builds from these considerations, gaps, and conflicts to provide multiple research directions in VR for marketers in three key domains: methodology, future studies, and consumer behavior. We hope that the classification of suggested questions into these three domains will help marketers better prioritize future research according to needs, expertise, and capabilities. Next, we discuss some of these opportunities in more detail.

*Insert Table 3 Here*

*Insert Table 4 Here*

Given that the applications vary in immersion and potential for flow, certain applications (Quadrant I and III) are more conducive for conducting future studies research because AVEs and VWs promise high ecological validity. That is, the high immersion of these applications lead to more realistic representations of environments that could be believably encountered in the “real” world and, in the case of highly realistic VR environments, offer clearer blueprints for the replication of the virtual space. As such, scholars can make more confident assertions of generalizability to actual consumer contexts based on the findings of such studies. Specifically, scholars should consider using VWs and AVEs differently to study group-level versus individual consumer behaviors. For example, the social connectivity within VWs enable explorations of social phenomenon, which can be utilized to test group interactions in consumer environments. Such research would greatly benefit contexts in which group influences are strong in consumer decisions, such as restaurants, shopping malls, supermarkets, and educational centers.

Testing new environments or consumer input (e.g. co-creation activities or behavioral responses) provided new stimuli, such as innovative shopping environments, would be a fruitful endeavor with AVEs because such environments will likely require the high immersion and realistic multisensory engagement that AVEs can offer, which cannot be achieved through less immersive applications or is less easily achievable in more fantastical environments, like VWs. For instance, co-creation research may greatly benefit from AVE studies in that high immersion draws consumer attention and focus to the context, which can boost engagement with the task and likely lead to stronger co-creation outcomes. Moreover, AVEs can be used to evaluate how co-creation activities enhance consumer relationships with brands.

Given that the findings of some research suggest that not all VR applications provide ecological validity, it is imperative to better comprehend differences, especially since the

world is becoming more virtual in all aspects of life and more purchases are likely to occur virtually. In fact, some VR research indicates that virtual service quality perceptions (e.g., related to SERVQUAL) and co-creation processes are not comparable to those of the real world (Gadalla et al., 2013; Kohler et al., 2011). The fact that limited research has attempted to explore this fact further motivates more marketing research. Specifically, scholars should investigate and document these differences so that marketers can develop more effective service strategies in the virtual space. For example, the use of avatars in virtual service environments can increase perceptions of agency and humanity in virtual assistants, though additional research is needed in this vein. Can avatars build consumer-brand relationships as well as actual humans, and if so, what conditions must exist for this relationship building to occur? Additionally, would the use of avatars actually be detrimental in certain situations, such as with the purchase of sensitive products or handling of sensitive information?

While VR applications represent invaluable research tools for understanding the far-off future for marketers, VR also provides several opportunities for undertaking research to understand consumer behavior in the present and near future. Simulations can be used to evaluate consumer behavior and conduct research to understand theory from a less immersive standpoint, offering the ability to implement more realistic, believable manipulations in experiments. Additionally, simulations represent a low-cost, low-risk approach for marketers to invest in VR. In many cases, the use of more extensive and immersive VR equipment (i.e., AVEs) would not yield more advantages in conducting quick experiments (Renaud et al., 2003), such that evaluating reactions to product/package designs, pricing information, or navigability of online retail spaces are better served using simulations.

As another example of how simulations can be useful in answering present-day research questions, VR offers a unique opportunity to study crossmodal correspondences – that is, perceived “matches” across multiple sensory cues that lead to more positive consumer

responses to stimuli (Spence, 2011) – in more realistic settings. The testing of sensory manipulations often involves contrived settings in laboratory rooms due to the need for high experimental control, and testing in actual field settings can introduce several confounds to crossmodal correspondences. VR in a laboratory environment affords the ability to induce perceptions of realistic settings while also maintaining the same degree of experimental control (Banos et al., 2004; Kozlov and Johansen, 2010; Whang and Chang, 2004). Given the high interest in and steady growth of the crossmodal correspondence literature (for examples of recent works, see Adams and Douce, 2017; Brunetti et al., 2018; Chen et al., 2018; and Jonas et al., 2017), VR can advance the research possibilities and ecological validity of such studies.

Similarly, the use of games in research is important to study marketing phenomena. Yet, little progress has been made in understanding this VR application, even outside of marketing. Some of the future research conducted using game simulations should be directed to evaluating the role of flow in low immersion, the role of the avatar, and gamification, among other topics. For instance, it would be relevant to explore how gamification affects consumers and affects consumer attitudes and decision-making, especially given the increasing use of gamification strategies in CRM. Clearly, more marketing research should be devoted to exploring gaming simulations from a methodological, theory-driven perspective as well as a strategic perspective to improve consumer-brand relationships.

## **Conclusion**

This systematic literature review provides several contributions. First, this work unifies divergent literature areas to provide a typology of VR (Figure 2). This is one of the first instances in which all VR applications have been combined to generate considerations for VR research. Second, through the systematic literature review, we examine differences in VR



applications, including their viability for future studies and consumer research, and identify three themes (i.e., application quality, interactivity, and the avatar) that uniquely contribute to flow (Figure 1) depending on the application. Third, we gauge the current state of research in Table 1 and provide evidence of the lack of marketing research in VR. While marketing has focused some research in VWs and simulations, much of this research is either qualitative and self-focused (in the case of VWs) or related to virtual stores (in the case of simulations). Clearly, there is a paucity of marketing research in VR.

An overwhelming majority of this research either treated VR applications as silos and very rarely examined multiple VR applications or assumed that the results from the study transferred to other VR applications. As a fourth contribution, we summarize the state of research, detailed in Table 2, and suggest that prior assumptions may not hold. More research is needed to ascertain assumptions of VR application utility as well as the highlighted gaps and research conflicts. Fifth, we speak to how marketing research can use VR applications to further marketing-related research. Based on the unique operationalizations, advantages and disadvantages of each quadrant, we present Table 3 to advance scholarship. Each quadrant presents a particular opportunity for marketers depending on immersion and realism. Lastly, we prioritize research for marketers (Table 4), demarcating how each application can be used in future studies research and proposing directions for future research. These ideas should be a springboard to launch marketing research in VR applications and make methodological and theoretical contributions to the marketing discipline.

## References

- Adams, C. and Douce, L. (2017). "The effect of crossmodal congruency between ambient scent and the store environment on consumer reactions: An abstract," in Stieler M. (eds.) *Creating Marketing Magic and Innovative Future Marketing Trends. Proceedings of the Academy of Marketing Science*.
- Ahn, S.J., Johnsen, K., Moore, J., Brown, S., Biersmith, M., and Ball, C. (2016), "Using virtual pets to increase fruit and vegetable consumption in children: A technology-assisted social cognitive theory approach," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 2, pp. 86-92.
- Algharabat, R. and Dennis, C. (2010), "3D product authenticity model for online retail: An invariance analysis", *International Journal of Business Science and Applied Management*, Vol. 5 No. 3, pp. 14-30.
- Ali, A. and Frew, A.J., "ICT and sustainable tourism development: an innovative perspective," *Journal of Hospitality and Tourism Technology*, Vol. 5 No. 1, pp. 2-16.
- Alshaer, A., Regenbrecht, H., and O'Hare, D. (2017), "Immersion factors affecting perception and behaviour in a virtual reality power wheelchair simulator", *Applied Ergonomics*, Vol. 58, pp. 1-12.
- Animesh, A., Pinsonneault, A., Yang, S., and Oh, W. (2011), "An odyssey into virtual worlds: Exploring the impacts of technological and spatial environments," *MIS Quarterly*, Vol. 35 No. 3, pp. 789-810.
- Bailey, R., Wise, K., and Bolls, P. (2009), "How avatar customizability affects children's arousal and subjective presence during junk food-sponsored online video games," *Cyberpsychology and Behavior*, Vol. 12 No. 3, pp. 277-83.
- Banakou, D., Chorianopoulos, K., and Anagnostou, K. (2009), "Avatars' appearance and social behavior in online virtual worlds", *13th Panhellenic Conference on Informatics*, pp. 207-11.
- Baños, R.M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., and Rey, B. (2004), "Immersion and emotion: Their impact on the sense of presence", *Cyberpsychology and Behavior*, Vol. 7 No. 6, pp. 734-41.
- Baños, R.M., Botella, C., Rubio, I., Quero, S., Garcia-Palacios, and Alcaniz, M., (2008), "Presence and emotions in virtual environments: The influence of stereoscopy," *Cyberpsychology and Behavior*, Vol. 11 No. 1, pp. 1-8.
- Bates, R., Istance, H.O., and Vickers, S. (2010), "Gaze interaction with virtual on-line communities: levelling the playing field for disabled users", *Universal Access in the Information Society*, Vol. 9 No. 3, pp. 261-72.
- Bell, J.J. (2003), "Exploring the singularity", *Futurist*, Vol. 37 No. 3, pp.18-25.
- Berg, L.P. and Vance, J.M. (2016), "Industry use of virtual reality in product design and manufacturing: A survey," *Virtual Reality*, Vol. 21 No. 1, pp. 1-17.
- Berthon, P., Pitt, L., Halvorson, W., Ewing, M., and Crittenden, V. L. (2010), "Advocating avatars: The salesperson in Second Life," *Journal of Personal Selling & Sales Management*, Vol. 30 No. 3, pp. 195-208.
- Bhatt, G. (2004), "Bringing virtual reality for commercial web sites," *International Journal of Human Computer Studies*, Vol. 60 No. 1, pp. 1-15.
- Bigne, E., Llinares, C., and Torrecilla, C. (2016), "Elapsed time on first buying triggers brand choices within a category: A virtual reality-based study", *Journal of Business Research*, Vol. 69 No. 4, pp. 1423-7.
- Biocca, F. and Delaney, B. (1995), "Immersive virtual reality technology", in Biocca, F. and Levy, M.R. (Eds.) *Communication in the Age of Virtual Reality*, Lawrence Erlbaum Associates Inc., Hillsdale, NJ. pp. 57-124.

- Boellstorff, T., Nardi, B., Pearce, C. and Taylor, T.L. (2012), *Ethnography and Virtual Worlds: A Handbook of Method*, Princeton University Press, Princeton, NJ.
- Boulaire, C., Graf, R., and Guelmami, R. (2008), "Online communities serving the consumer/producer: observations from the study of a fantasy world," *Direct Marketing: An International Journal*, Vol. 2 No. 4, pp. 199-220.
- Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology," *Quantitative Research in Psychology*, Vol. 3 No. 2, pp. 77-101.
- Brunetti, R., Indraccolo, A., del Gatto, C., Spence, C., and Santangelo, V. (2018), "Are crossmodal correspondences relative or absolute? Sequential effects on speeded classification," *Attention, Perception, & Psychophysics*, Vol. 80 No. 2, pp. 527-34.
- Burke, Raymond. (1996). Virtual shopping: Breakthrough in marketing research. *Harvard Business Review*, Vol. 74, pp. 120-31.
- Burrows, C.N. and Blanton, H. (2015), "Real-world persuasion from virtual-world campaigns," *Communication Research*, Vol. 43 No. 4, pp. 542-70.
- Calogiuri, G., Litleskare, S., Fagerheim, K.A., Rydgren, T.L., Brambilla, E., and Thurston, M. (2018), "Experiencing nature through immersive virtual environments: Environmental perceptions, physical engagement, and affective responses during a simulated nature walk," *Frontiers in Psychology*, Vol. 23 No. 8, Article 2321.
- Chan, K.W., and Li, S.Y. (2010), "Understanding consumer-to-consumer interactions in virtual communities: The salience of reciprocity," *Journal of Business Research*, Vol. 63 No. 9-10, pp. 1033-40.
- Chen, Y., Huang, P., Woods, A., and Spence, C. (2018), "I know that "Kiki" is angular: The metacognition underlying sound-shape correspondences," *Psychonomic Bulletin & Review*, doi: 10.3758/s13423-018-1516-8.
- Chirico, A., Ferrise, F., Cordella, L., and Gaggioli, A. (2017), "Designing awe in virtual reality: An experimental study," *Frontiers in Psychology*, Vol. 8, Article 2351.
- Christy, K.R. and Fox, J. (2016), "Transportability and presence as predictors of avatar identification within narrative video games," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 4, pp. 283-7.
- Cowen, T. (2013), *Average is Over: Powering America Beyond the Age of the Great Stagnation*, Dutton, New York, NY.
- Cram, A., Hedberg, J.G., Gosper, M., and Dick, G. (2011), "Situated, embodied and social problem-solving in virtual worlds", *Research in Learning Technology*, Vol. 19 No. 3, pp. 259-71.
- Cummings, J.J. and Bailenson, J.N. (2015), "How immersive is enough? a meta-analysis of the effect of immersive technology on user presence", *Media Psychology*, Vol. 19 No. 2, pp. 272-309.
- Csikszentmihalyi, M. (1997), *Finding flow: The psychology of engagement with everyday life*, New York, NY, US: Basic Books.
- Daugherty, T., Li, H., and Biocca, F. (2008), "Consumer learning and the effects of virtual experience relative to indirect and direct product experience," *Psychology & Marketing*, Vol. 25 No. 7, pp. 568-86.
- Dholakia, N. and Reyes, I. (2013), "Virtuality as place and process", *Journal of Marketing Management*, Vol. 29 No. 13/14, pp. 1580-91.
- Dobrolowski, P., Pochwatko, G., Skorko, M., and Bielecki, M. (2014), "The effects of virtual experience on attitudes toward real brands," *Cyberpsychology, Behavior, and Social Networking*, Vol. 17 No. 2, pp. 125-8.
- Domina, T., Lee, S., and MacGillivray, M. (2012), "Understanding factors affecting consumer intention to shop in a virtual world," *Journal of Retailing and Consumer Services*, Vol. 19 No. 6, pp. 613-20.

- Eye Faster (2017), Virtual reality: looking toward the future of market research. Retrieved from: <http://eyefaster.com/virtual-reality-looking-toward-the-future-of-market-research/>
- Faiola, A., Newlon, C., Pfaff, M., and Smyslova, O. (2013), "Correlating the effects of flow and telepresence in virtual worlds: Enhancing our understanding of user behavior in game-based learning," *Computers in Human Behavior*, Vol. 29 No. 3, pp. 1113-21.
- Fiore, S.M., Harrison, G.W., Hughes, C.E., and Rutstrom, E.E. (2009), "Virtual experiments and environmental policy", *Journal of Environmental Economics and Management*, Vol. 57, pp. 65-86.
- Fox, J., Arena, D., and Bailenson, J.N. (2009), "Virtual reality: a survival guide for the social scientist", *Journal of Media Psychology*, Vol. 21 No. 3, pp. 95-113.
- Friend, C. and Hamilton, N.F. (2016), "Deception detection: The relationship of levels of trust and perspective taking in real-time online and offline communication environments," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 9, pp. 532-7.
- Gadalla, E., Keeling, K., Abosag, I. (2013), "Metaverse-retail service quality: A future framework for retail service quality in the 3D internet," *Journal of Marketing Management*, Vol. 29 No. 13-14, pp. 1493-517.
- Gimblett, H.R., Richards, M.T., and Itami, R.M. (2001), "Geographic simulation of wilderness recreation behavior", *Journal of Forestry*, Vol. 99, pp. 36-42.
- Glazer, E. (2017), "The eyes have it: Marketers now track shoppers' retinas," Retrieved from: <https://www.wsj.com/articles/SB10001424052702303644004577520760230459438>
- Goel, L. and Prokopec, S. (2009), "If you build it will they come?—An empirical investigation of consumer perceptions and strategy in virtual worlds," *Electronic Commerce Research*, Vol. 9 No. 1-2, pp. 115-34.
- Grinberg, A.M., Careaga, J.S., Mehl, M.R., O'Connor, M. (2014), "Social engagement and user immersion in a socially based virtual world," *Computers in Human Behavior*, Vol. 36, pp. 479-86.
- Guo, Y. and Barnes, S. (2009), "Virtual item purchase behavior in virtual worlds: an exploratory investigation," *Electronic Commerce Research*, Vol. 9, pp. 77-96.
- Gutierrez, M., Vexo, F., and Thalmann, D. (2008), *Stepping into Virtual Reality*, Springer-Verlag, London.
- Guttentag, D. (2010), "Virtual Reality: Applications and Implications for Tourism," *Tourism Management*, Vol. 31 No. 5, pp. 637-51.
- Halvorson, W., Ewing, M., and Windisch, L. (2011), "Using Second Life to teach about marketing in Second Life," *Journal of Marketing Education*, Vol. 33 No. 2, pp. 217-28.
- Harrison, G.W., Haruvy, E., Rutstrom, E.E. (2011). "Remarks on virtual world and virtual reality experiments", *Southern Economic Journal*, Vol. 78 No. 1, pp. 87-94.
- Hershfield, H.E., Goldstein, D.G., Sharpe, W.F., Fox, J., Yeykelis, L., Carstensen, L.L., et al. (2011), "Increasing Saving Behavior through Age-Progressed Renderings of the Future Self," *Journal of Marketing Research*, Vol. 48, pp. S23-S37.
- Hines, A. and Bishop, P.J. (2006), *Thinking About the Future: Guidelines for Strategic Foresight*, Social Technologies, Washington, D.C.
- Huang, Y.C., Backman, S.J., and Backman, K.F. (2011), "Exploring the impacts of involvement and flow experiences in Second Life on people's travel intentions," *Journal of Hospitality and Tourism Technology*, Vol. 3 No. 1, pp. 4-23.
- Hyun, M.H. and O'Keefe, R.M. (2012), "Virtual destination image: Testing a telepresence model," *Journal of Business Research*, Vol. 65, pp. 29-35.
- Innocenti, A. (2017), "Virtual reality experiments in economics", *Journal of Behavioral and Experimental Economics*, Vol. 69, pp. 71-7.

- Jiang, Z. and Benbasat, I. (2005), "Virtual product experience: effects of visual and functional control of products on perceived diagnosticity and flow in electronic shopping", *Journal of Management Information Systems*, Vol. 21, pp. 111–148.
- Jin, S.A. (2009), "Modality effects in Second Life: The mediating role of social presence and the moderating role of product involvement," *Cyberpsychology and Behavior*, Vol. 12 No. 6, pp. 717-21.
- Jin, S.A. (2010a), "Does imposing a goal always improve exercise intentions in avatar-based exergames? The moderating role of interdependent self-construal on exercise intentions and self-presence," *Cyberpsychology, Behavior, and Social Networking*, Vol. 13 No. 3, pp. 335-9.
- Jin, S.A. (2010b), "Effects of 3D virtual haptics force feedback on brand personality perception: The mediating role of physical presence in advergames," *Cyberpsychology, Behavior, and Social Networking*, Vol. 13 No. 3, pp. 307-11.
- Jin, S.A. and Park, N. (2009), "Parasocial interaction with my avatar: Effects of interdependent self-construal and the mediating role of self-presence in an avatar-based console game, Wii," *Cyberpsychology and Behavior*, Vol. 12 No. 6, pp. 723-27.
- Jones, C., Spiller, M.J., and Hibbard, P. (2017), "Summation of visual attributes in auditory–visual crossmodal correspondences," *Psychonomic Bulletin & Review*, Vol. 24 No. 4, pp. 1104-12.
- Kim, B. (2012), "Understanding key factors of users' intentions to repurchase and recommend digital items in social virtual worlds," *Cyberpsychology, Behavior, and Social Networking*, Vol. 15 No. 10, pp. 543-50.
- Kim, G. (2017), *Designing Virtual Reality Systems: The Structured Approach*, Springer-Verlag, London.
- Kim, K., Park, K.K., and Lee, J. (2014), "The influence of arousal and expectation on eyewitness memory in a virtual environment," *Cyberpsychology, Behavior, and Social Networking*, Vol. 17 No. 11, pp. 709-13.
- Kohler, T., Fueller, J., Matzler, K., Stieger, D., and Fuller, J. (2011), "Co-creation in virtual worlds: The design of the user experience," *MIS Quarterly*, Vol. 35 No. 3, pp. 773-88.
- Kostyk, A. and Hyman, M. (2015), "Critical marketing, future studies, and re-imagining marketing", *NMSU Business Outlook*, Vol. 13 No. 3, pp. 1-8.
- Kozlov, M.D. and Johansen, M.K. (2010), "Real behavior in virtual environments: Psychology experiments in a simple virtual-reality paradigm using video games," *Cyberpsychology, Behavior, and Social Networking*, Vol. 13 No. 6, pp. 711-14.
- Krasonikolakis, I., Vrechopoulos, A., Pouloudi, A., Dimitriadis, S. (2018), "Store layout effects on consumer behavior in 3D online stores," *European Journal of Marketing*, Vol. 52 No. 5/6, pp. 1223-56.
- Kuo, H.C., Lee, C.C., and Chiou, W.B. (2016), "The power of the virtual ideal self in weight control: Weight-reduced avatars can enhance the tendency to delay gratification and regulate dietary practices," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 2, pp. 80-5.
- Kurzweil, R. (2005), *The Singularity is Near: When Humans Transcend Biology*, Viking, New York, NY.
- Li, M. and Buchthal, S. (2012), "Advisory services in the virtual world: An empowerment perspective", *Electronic Commerce Research*, Vol. 12 No. 1, pp. 53-96.
- Liao, T. (2017), "Online shopping post-payment dissonance: Dissonance reduction strategy using online consumer social experiences," *International Journal of Information Management*, Vol. 37 No. 6, pp. 520-38.

- Loomis, J.M., Blascovich, J.J., and Beall, A.C. (1999), "Immersive virtual environment technology as a basic research tool in psychology", *Behavior Research Methods, Instruments, & Computers*, Vol. 31 No. 4, pp. 557-64.
- Lowe's Innovation Labs (2018), "Holoroom," last accessed June 7, 2018 from <http://www.lowesinnovationlabs.com/holoroom/>
- Macedonio, M.F., Parsons, T.D., Diguseppe, R.A., Weiderhold, B.K., and Rizzo, A.A. (2007), "Immersiveness and physiological arousal within panoramic video-based virtual reality," *Cyberpsychology and Behavior*, Vol. 10 No. 4, pp. 508-15.
- Mackenzie, K., Buckby, S., and Irvine, H. (2009), "A framework for evaluating business lead users' virtual reality innovations in Second Life," *Electronic Commerce Research*, Vol. 9 No. 3, pp. 183-202.
- Mantymaki, M. and Salo, J. (2013), "Purchasing behavior in social virtual worlds: An examination of Habbo Hotel," *International Journal of Information Management*, Vol. 33 No. 2, pp. 282-90.
- Matthews, N.L. (2015), "Too good to care: The effect of skill on hostility and aggression following violent video game play," *Computers in Human Behavior*, Vol. 48, 219-25.
- Mazursky, D. and Vinitzky, G. (2005), "Modifying consumer search processes in enhanced on-line interfaces," *Journal of Business Research*, Vol. 58, pp. 1299-309.
- Meißner, M., Pfeiffer, J., Pfeiffer, T., and Oppewal, H. (2017), "Combining virtual reality and mobile eye tracking to provide a naturalistic experimental environment for shopper research," *Journal of Business Research*, in press.
- Meijer, F., Geudeke, B. L., and van den Broek, E. (2009), "Navigating through virtual environments: Visual realism improves spatial cognition," *Cyberpsychology and Behavior*, Vol. 12 No. 5, pp. 517-21.
- Molesworth, M. (2006), "Real brands in imaginary worlds: Investigating players' experiences of brand placement in digital games," *Journal of Consumer Behaviour*, Vol. 5 No. 4, pp. 355-66.
- Mountford, V.A., Tchanturia, K., and Valmaggia, L. (2016), "'What are you thinking when you look at me?' A pilot study of the use of virtual reality in body image," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 2, pp. 93-9.
- Moutinho, L., Teixeira, N. and Lage, M. (2014), "Futures research insights and methods", in Moutinho, L., Bigné, E., Manrai, A.K. (Eds.), *The Routledge Companion to the Future of Marketing*, Routledge, New York, NY, pp. 416-448.
- Nah, F.F., Eschenbrenner, B., and DeWester, D. (2011), "Enhancing brand equity through flow and telepresence: A comparison of 2D and 3D virtual worlds," *MIS Quarterly*, Vol. 35 No. 3, pp. 731-47.
- Nakamura, J. and Csikszentmihályi, M. (2001), "The concept of flow," in Snyder, C. R. and Lopez, S. J. (Ed.), *Oxford Handbook of Positive Psychology*, Oxford University Press, USA, pp. 89-105.
- Papagiannidis, S., Pantano, E., See-To, E.W.K., and Bourlakis, M. (2013), "Modelling the determinants of a simulated experience in a virtual retail store and users' product purchasing intentions", *Journal of Marketing Management*, Vol. 29 No. 13/14, pp. 1462-92.
- Parsons, T.D. (2015), "Virtual reality for enhanced ecological validity and experimental control in the clinical, affective and social neurosciences", *Frontiers in Human Neuroscience*, Vol. 9, pp. 1-19.
- Parsons, T.D., Gaggioli, A., and Riva, G. (2017), "Virtual reality for research in social neuroscience", *Brain Sciences*, Vol. 7 No. 4, pp. 42.
- Pena, J., Hancock, J.T., and Merola, N.A., (2009), "The priming effects of avatars in virtual settings," *Communication Research*, Vol. 36 No. 6, pp. 838-56.

- Poeschl, S. and Doering, N. (2013), "The German VR simulation realism scale – Psychometric construction for virtual reality applications with virtual humans," *Student Health Technology Information*, Vol. 191, pp. 33-7.
- Przybylski, A.K., Weinstein, N., Murayama, K., Lynch, M.F., and Ryan, R.M. (2011), "The ideal self at play: The appeal of video games that let you be all you can be," *Psychological Science*, Vol. 23 No. 1, pp. 69-76.
- Renaud, P., Decarie, J., Gourd, S., Paquin, L., and Bouchard, S. (2003), "Eye-tracking in immersive environments: A general methodology to analyze affordance-based interactions from oculomotor dynamics", *Cyberpsychology & Behavior*, Vol. 6 No. 5, pp. 519-26.
- Romeo, C. (2017), "Topshop just launched a VR waterslide where you twist and turn through central London," last accessed June 7, 2018 from [www.businessinsider.com/topshop-virtual-reality-waterslide-twist-turn-oxford-street-central-london-summer-season-2017-5](http://www.businessinsider.com/topshop-virtual-reality-waterslide-twist-turn-oxford-street-central-london-summer-season-2017-5)
- Roussou, M. (2004), "Learning by doing and learning through play: an exploration of interactivity in virtual environments for children," *Computers in Entertainment*, Vol. 2 No. 1, p. 10.
- Saren, M., Harwood, T., Ward, J., and Venkatesh, A. (2013), "Marketing beyond the frontier? researching the new marketing landscape of virtual worlds", *Journal of Marketing Management*, Vol. 29 No. 13/14, pp. 1435–42.
- Saunders, C., Rutkowski, A.F., van Genuchten, M., Vogel, D., and Orrego, J.M. (2011), "Virtual space and place: Theory and test," *MIS Quarterly*, Vol. 35 No. 4, pp. 1079-98.
- Schlosser, A.E. (2003), "Experiencing products in the virtual world: The role of goal and imagery in influencing attitudes versus purchase intentions," *Journal of Consumer Research*, Vol. 30 No. 2, pp. 184-98.
- Schonbrodt, F.D. and Asendorpf, J.B. (2011), "Virtual social environments as a tool for psychological assessment: dynamics of interaction with a virtual spouse," *Psychological Assessment*, Vol. 23 No. 1, pp. 7-17.
- Schultze, U. and Rennecker, J. (2007). "Reframing online games: synthetic worlds as media for organizational communication", in Crowston, K., Sieber, S., and Wynne, E. (Eds.), *Virtuality and Virtualization*, Springer, Boston, MA, pp. 335-51.
- Silva, C., Rebelo, F., Vilar, E., and Noriega, P. (2015), "Preliminary study about social influence over wayfinding decisions," *Procedia Manufacturing*, Vol. 3, pp. 5920-6.
- Slobounov, S.M., Ray, W., Johnson, B., Slobounov, E., and Newell, K.M. (2015), "Modulation of cortical activity in 2D versus 3D virtual reality environments: An EEG study", *International Journal of Psychophysiology*, Vol. 95 No. 3, pp. 254-60.
- Smolenstev, A., Cornick, J.E., and Blascovich, J. (2017), "Using a preamble to increase presence in digital virtual environments," *Virtual Reality*, Vol. 21 No. 3, pp. 153-64.
- Soderman, M. (2005), "Virtual reality in product evaluations with potential customers: An exploratory study comparing virtual reality with conventional product representations," *Journal of Engineering Design*, Vol. 16 No. 3, pp. 311-28.
- Spence, C. (2011), "Crossmodal correspondences: A tutorial review," *Attention, Perception, and Psychophysics*, Vol. 73 No. 4, pp. 971-95.
- Sturz, B.R., Bodily, K.D., and Katz, J.S., (2009), "Dissociation of past and present experience in problem solving using a virtual environment," *Cyberpsychology and Behavior*, Vol. 12 No. 1, pp. 15-9.
- Sun, H.M., Li, S.P., Zhu, Y.Q., and Hsiao, B. (2015), "The effect of user's perceived presence and promotion focus on usability for interacting in virtual environments," *Applied Ergonomics*, Vol. 50, pp. 126-32.

- Tan, D.S., Gergle, D., Scupelli, P., and Pausch, R. (2006), "Physically large displays improve performance on spatial tasks," *Communication Studies*, Vol. 13 No. 1, pp. 71-99.
- Toet, A., van Welie, M., and Houtkamp, J. (2009), "Is a dark virtual environment scary?," *Cyberpsychology and Behavior*, Vol. 12 No. 4, pp. 363-71.
- Tranfield, D., Denyer, D., and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review," *British Journal of Management*, Vol. 14, pp. 207-22.
- Tremblay, L. Roy-Vaillancourt, M., Chebbi, B., Bouchard, S. Daoust, M., Denommee, J., et al. (2016), "Body image and anti-fat attitudes: An experimental study using a haptic virtual reality environment to replicate human touch," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 2, pp. 100-6.
- Valtchanov, D., Barton, K.R., and Ellard, C. (2010), "Restorative effects of virtual nature settings," *Cyberpsychology, Behavior, and Social Networking*, Vol. 13 No. 5, pp. 503-12.
- Van der Duin, P. (2016), *Foresight in Organizations: Methods and Tools*, Routledge, New York, NY.
- Van der Land, S., Schouten, A.P., Feldberg, F., van den Hooff, B., Huysman, M. (2013), "Lost in space? Cognitive fit and cognitive load in 3D virtual environments," *Computers in Human Behavior*, Vol. 29 No. 3, pp. 1054-64.
- Vashisht, D. and Chauhan, A. (2017), "Effect of game-interactivity and congruence on presence and brand attitude," *Marketing Intelligence & Planning*, Vol. 35 No. 6, pp. 789-804.
- Verhagen, T., Vonkeman, C., and van Dolen, W. (2016), "Making online products more tangible: The effect of product presentation formats on product evaluations," *Cyberpsychology, Behavior, and Social Networking*, Vol. 19 No. 7, pp. 460-4.
- Vinayagamoorthy, V., Garau, M., Steed, A., and Slater, M. (2004), "An eye gaze model for dyadic interaction in an immersive virtual environment: Practice and experience," *Computer Graphics Forum*, Vol. 23 No. 1, pp. 1-11.
- Vince, J. (2004). *Introduction to Virtual Reality*, Springer, New York.
- Wallet, G., Sauzeon, H., Pala, P.A., Larrue, F., Zheng, X., and N'Kaoua, B. (2011), "Virtual/real transfer of spatial knowledge: benefit from visual fidelity provided in a virtual environment and impact of active navigation," *Cyberpsychology, Behavior, and Social Networking*, Vol. 14 No. 7-8, pp. 417-23.
- Waltemate, T., Gall, D., Roth, D., Botsch, M., and Latoschik, M.E. (2009), "The impact of avatar personalization and immersion on virtual body ownership, presence, and emotional response," *IEEE Transactions on Visualization and Computer Graphics*, Vol. 24 No. 4, pp. 1643-52.
- Washburn, D.A. (2003), "The games psychologists play (and the data they provide)," *Behavior Research Methods, Instruments, & Computers*, Vol. 35 No. 2, pp. 185-93.
- Weibel, D., Wissmath, B., Habegger, S., Steiner, Y., and Groner, R. (2008), "Playing online games against computer- vs. human-controlled opponents: Effects on presence, flow, and enjoyment," *Computers in Human Behavior*, Vol. 24 No. 5, pp. 2274-91.
- Whang, L.S. and Chang, G. (2004), "Lifestyles of virtual world residents: Living in the on-line game 'lineage'," *Cyberpsychology and Behavior*, Vol. 7 No. 5, pp. 592-600.
- Wilson, J.R., Eastgate, R.M., and D'Cruz, M., (2002), "Structured development of virtual Environments", in: Stanney, K.M. (Ed.), *Handbook of Virtual Environments*, Erlbaum, Mahwah, NJ, pp. 353-78.
- Wind, Y. (2014), "Toward a new marketing paradigm", in Moutinho, L., Bigné, E., Manrai, A.K. (Eds.), *The Routledge Companion to the Future of Marketing*, Routledge, New York, NY, pp. 3-24.



- Wissmath, B., Weibel, D., Schmutz, J., and Mast, F.W. (2011), "Being present in more than one place at a time? Patterns of mental self-localization," *Consciousness and Cognition*, Vol. 20 No. 4, pp. 1808-15.
- Wu, J. and Kraemer, P. (2017), "Positive preferences: The emotional valence of what an avatar says matters," *Cyberpsychology, Behavior, and Social Networking*, Vol. 20 No. 1, pp. 17-21.
- Wu, J., Chen, Y., and Chung, Y. (2010), "Trust factors influencing virtual community members: A study of transaction communities," *Journal of Business Research*, Vol. 63 No. 9-10, pp. 1025-32.
- Yee, N., and Bailenson, J.N. (2008), "A method for longitudinal behavioral data collection in Second Life", *PRESENCE: Teleoperators and Virtual Environments*, Vol. 17 No. 6, pp. 594-6.
- Young, G. (2010), "Virtually real emotions and the paradox of fiction: implications for the use of virtual environments in psychological research", *Philosophical Psychology*, Vol. 23 No. 1, pp. 1-21.

**Figure 1. Themes Contributing to Flow in VR Applications**

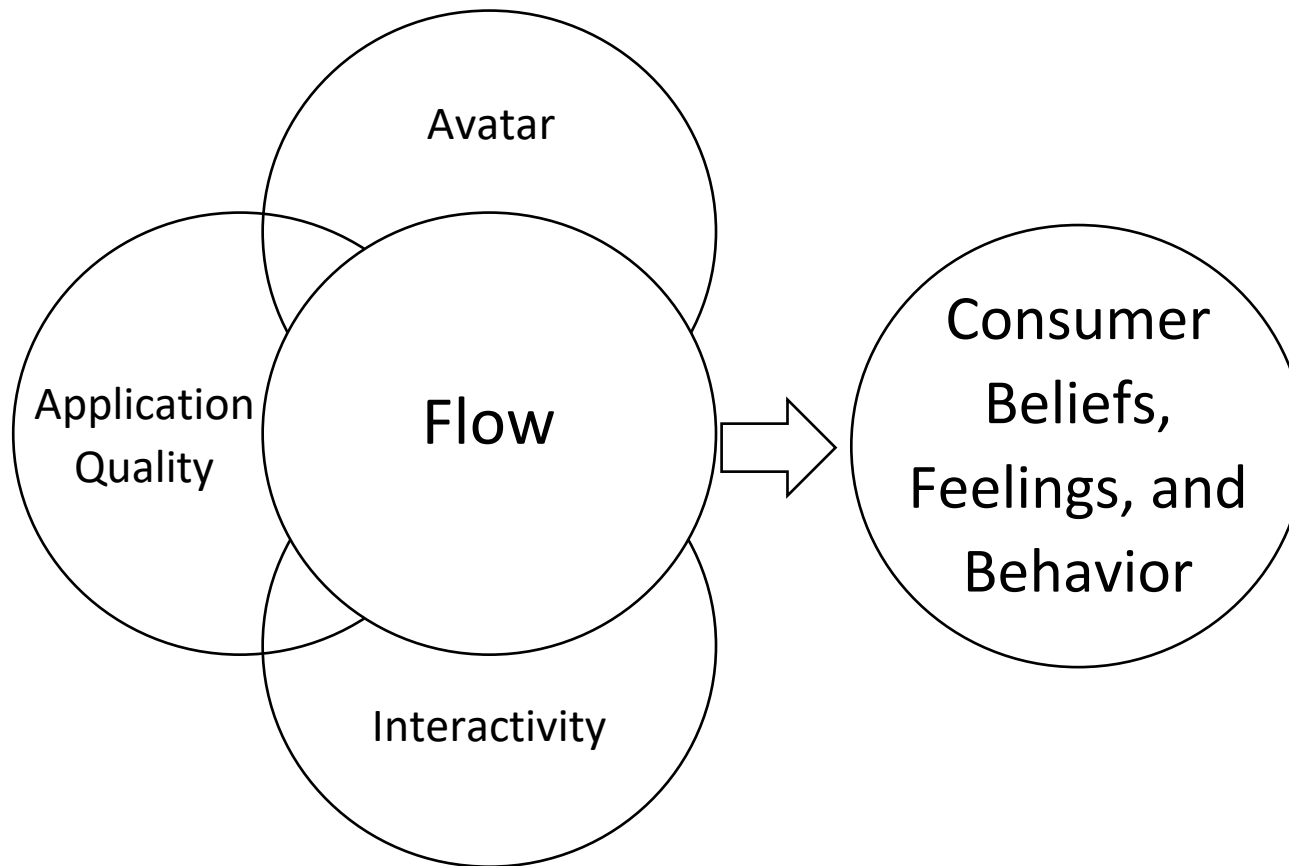


Figure 2. The VR Immersion/Realism Matrix

		User Immersion	
		<i>Greater (HIVE)</i>	<i>Lesser (LIVE)</i>
User Experience	<i>Reality</i>	QI  Automated Virtual Environments <ul style="list-style-type: none"> <li>• CAVES (e.g., tourism and virtual stores)</li> <li>• HMDs (e.g., retail concept/environment testing)</li> </ul>	QII  Simulations <ul style="list-style-type: none"> <li>• Product trials</li> <li>• Web-based remodeling simulations</li> </ul>
	<i>Fantasy</i>	QIII  Virtual Worlds <ul style="list-style-type: none"> <li>• MMORPGs (e.g., World of Warcraft)</li> <li>• Avatar-based social platforms (e.g., Second Life)</li> </ul>	QIV  Games <ul style="list-style-type: none"> <li>• Mobile games</li> <li>• Traditional video games</li> <li>• Computer games</li> </ul>

**Table 1. Descriptive Summary of Systematic Literature Review**

<b>Methodology</b>	<b>VR Application Quadrant</b>					<b>Total</b>
	Q1. AVEs	QII. Simulations	QIII. VWs	QIV. Games	Multiple Applications	
<b>Qualitative</b>						
Case Study	2	2	3 (1)		1	8 (1)
Focus Groups			2 (2)	1 (1)		3 (3)
Interviews		1	3 (2)			4 (2)
Net/ethnography			2 (2)			2 (2)
Other	1		2 (1)			3 (1)
<b>Quantitative</b>						
Experiment	23	24 (5)	12 (2)	14 (1)	4	77 (8)
Survey	3 (1)	7 (4)	13 (3)	3 (1)	1	27 (9)
Other			1			
			3 (1)			
<b>Mixed Method</b>	1					1
<b>Meta-Analysis</b>	1					1
<b>Total</b>	31 (1)	33 (9)	40 (14)	19 (3)	6	129 (27)

\*observations in marketing-related journals are noted in parentheses

**Table 2. Summary of Results of Systematic Literature Review by Quadrant**

	<b>QI. AVEs</b>	<b>QII. Simulations</b>	<b>QIII. VWs</b>	<b>QIV. Games</b>
<i>Degree of Realism</i>	Realism Important Fantasy Unexplored	Realism Critical	Real-Fantasy	Unexplored
<i>Degree of Immersion</i>	High	Low-Mid	High	Low-Mid
<i>Source of Immersion and Flow</i>	Application quality	Realism and value	Social connection	Avatar
<i>Avatar-focused Research</i>	<ul style="list-style-type: none"> <li>• Quality</li> <li>• Realism</li> <li>• Personalization</li> <li>• Others' avatars</li> </ul>	<ul style="list-style-type: none"> <li>• Liking</li> <li>• Field of View</li> <li>• Personalization</li> <li>• Self-congruency</li> </ul>	<ul style="list-style-type: none"> <li>• Clothing</li> <li>• Virtual Advisor</li> </ul>	Self-congruency
<i>Criteria for Application Quality</i>	<ul style="list-style-type: none"> <li>• Update rate</li> <li>• Field of view</li> <li>• Tracking level Stereoscopy</li> <li>• Sound quality</li> <li>• User perspective</li> <li>• Image quality</li> </ul>	<ul style="list-style-type: none"> <li>• Ease of navigation</li> <li>• Visual control</li> <li>• Functional control</li> <li>• Screen size</li> <li>• Realism (scene, audience appearance, audience behavior, layout, scenario)</li> </ul>	<ul style="list-style-type: none"> <li>• Usefulness</li> <li>• Ease of use</li> <li>• Navigation</li> <li>• Place</li> <li>• Space</li> <li>• Communication exchange</li> </ul>	<ul style="list-style-type: none"> <li>• Sensory feedback</li> <li>• Game content</li> </ul>
<i>Interactivity Considerations</i>	N/A	<ul style="list-style-type: none"> <li>• Connectivity with others</li> <li>• Customizability</li> </ul>	<ul style="list-style-type: none"> <li>• Co-creation</li> <li>• Community</li> <li>• Space</li> </ul>	<ul style="list-style-type: none"> <li>• Connectivity with others</li> <li>• Control over game</li> </ul>
<i>Role of Telepresence in Predicting Flow</i>	<ul style="list-style-type: none"> <li>• Telepresence mediates imagination-flow</li> </ul>	<ul style="list-style-type: none"> <li>• Telepresence moderates engagement-flow</li> </ul>	<ul style="list-style-type: none"> <li>• Telepresence mediates enjoyment-flow</li> </ul>	<ul style="list-style-type: none"> <li>• Telepresence mediates enjoyment-flow</li> </ul>
<i>Outcomes</i>	<ul style="list-style-type: none"> <li>• Predictions of behavior</li> <li>• Emotions</li> <li>• Mood</li> <li>• Telepresence</li> </ul>	<ul style="list-style-type: none"> <li>• Task accuracy</li> <li>• Diagnosticity</li> <li>• Knowledge</li> <li>• Anxiety reduction</li> <li>• Purchase intentions</li> <li>• Attitudes</li> <li>• Brand equity</li> <li>• Goal-consistent behavior</li> </ul>	<ul style="list-style-type: none"> <li>• Trust</li> <li>• Information value</li> <li>• Emotions</li> <li>• Exchange relationships</li> <li>• Emotional and rational judgments</li> <li>• Predictions of behavior</li> <li>• Purchases</li> </ul>	<ul style="list-style-type: none"> <li>• Choices after the game</li> <li>• Attitudes</li> <li>• Brand attitudes</li> <li>• Beliefs</li> <li>• Knowledge</li> </ul>
<i>Behavioral measures</i>	<ul style="list-style-type: none"> <li>• Eye gaze</li> <li>• Body movement</li> <li>• Head movement</li> <li>• Physiological responses</li> <li>• Virtual touch</li> </ul>	<ul style="list-style-type: none"> <li>• Navigation</li> <li>• Time spent</li> <li>• Task completion time</li> <li>• Task accuracy</li> <li>• Physiological responses</li> </ul>	<ul style="list-style-type: none"> <li>• Eye gaze</li> <li>• Actions</li> <li>• Interactions with others</li> </ul>	<ul style="list-style-type: none"> <li>• Time</li> <li>• Task accuracy</li> </ul>

**Table 3. Methodological Considerations for Conducting Research in Each Quadrant**

	Q1. AVEs	QII. Simulations	QIII. VWs	QIV. Games
<i>Future Studies Potential</i>	High	Very low	High	Low-Mid
<i>Research Applications and Operations</i>	<ul style="list-style-type: none"> <li>• Eye tracking (e.g. to operationalize variety seeking and telepresence)</li> <li>• Movement</li> <li>• Virtual touch</li> <li>• Avatar personalization</li> <li>• Priming emotions through VE</li> </ul>	<ul style="list-style-type: none"> <li>• Priming effects from avatar assignment</li> <li>• Encounter patterns (with objects or others)</li> <li>• Avatar personalization</li> </ul>	<ul style="list-style-type: none"> <li>• Co-creation value and participation</li> <li>• Network size</li> <li>• Priming through avatar assignment</li> <li>• Communication patterns</li> <li>• Virtual Goal progress</li> <li>• Purchase choices</li> <li>• Motion tracking</li> </ul>	<ul style="list-style-type: none"> <li>• Background vs. foreground messages</li> <li>• Sensory feedback</li> <li>• Training</li> <li>• Task accuracy and timing</li> <li>• Priming through game theme</li> <li>• Priming through avatar assignment</li> </ul>
<i>Advantages</i>	<ul style="list-style-type: none"> <li>• Ecological validity high (Kozlov and Johansen, 2010)</li> <li>• Depth of vision unimportant (Banos et al., 2008)</li> <li>• Easy to use avatar confederates in experiment (Tremblay et al., 2016)</li> <li>• Surrogate for real world (Valtchanov et al., 2010)</li> </ul>	<ul style="list-style-type: none"> <li>• Ecological validity high (Banos et al., 2004)</li> <li>• Learning potential (Daugherty et al., 2008)</li> <li>• No need to be immersive to create flow (Smolentsev et al., 2017)</li> <li>• Easier to invest in</li> <li>• Transportability</li> </ul>	<ul style="list-style-type: none"> <li>• Ecological validity (Whang and Chang, 2004)</li> <li>• Easy to observe community interactions and patterns</li> <li>• Evolving- newer formats of VWs</li> <li>• Not location-specific</li> <li>• Representative of society</li> <li>• Large-scale scenarios testable</li> </ul>	<ul style="list-style-type: none"> <li>• Generally, unaffected by emotions and anxiety traditionally evoked by training (Toet et al., 2009)</li> <li>• Can have high ecological validity and realism for research</li> <li>• New way to answer research questions (Washburn, 2003)</li> </ul>
<i>Disadvantages</i>	<ul style="list-style-type: none"> <li>• Quick experiments are less feasible as telepresence unfolds over time (Renaud et al., 2003)</li> <li>• External sensory cues can disrupt flow (Calogiuri et al., 2018)</li> <li>• More difficult to encourage and observe group interactions</li> </ul>	<ul style="list-style-type: none"> <li>• Arousal can reduce flow (Kim et al., 2014)</li> <li>• Scenarios/scenes must be realistic and expected (Meijer et al., 2009)</li> <li>• Use large displays (Tan et al., 2013)</li> <li>• More detail is required to create realism (Wallet et al., 2011)</li> </ul>	<ul style="list-style-type: none"> <li>• Gaze is not a good variable because of the game lags (Bates et al., 2010)</li> <li>• Less realistic social patterns vs. real world (Grinberg et al., 2014)</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of avatar-identification can decrease enjoyment and motivation (Przybylski et al., 2012)</li> <li>• May dislike brand presence in games (Molesworth, 2006)</li> <li>• Skilled players may experience lower emotional responses (Matthews, 2015)</li> <li>• Much unknown about this quadrant</li> </ul>
<i>Additional Remarks and Considerations</i>	<ul style="list-style-type: none"> <li>• For group decision-making, use static VEs to avoid overload (Van der Land et al., 2010)</li> <li>• Stereoscopy, field of view, and tracking level- most important</li> </ul>	<ul style="list-style-type: none"> <li>• Avatar role important in enhancing realism (Alshaer et al., 2017)</li> <li>• Balance interactivity, connectivity, and immersivity (Bhatt, 2004)</li> </ul>	<ul style="list-style-type: none"> <li>• Social interactions must be realistic to increase immersion and enjoyment (Grinberg et al., 2014)</li> </ul>	<ul style="list-style-type: none"> <li>• Human (vs. computer) opponents increase flow states (Weibel et al., 2008)</li> </ul>

	<p>quality features (Cummings and Bailenson, 2015)</p> <ul style="list-style-type: none"> <li>• Participants can(not) see avatars with HMDs (CAVEs); avatar is important (Skarbez et al., 2006; Vinayagamoorthy et al., 2004)</li> <li>• Body scan to create avatars</li> <li>• Emotional priming can increase immersion (Banos et al., 2004)</li> </ul>	<ul style="list-style-type: none"> <li>• Visual (functional) control increases appearance (functional) diagnosticity (Jiang and Benbasat, 2005)</li> <li>• Choices made in 3D simulations do not always represent real world choice; should also compare habitual to simulation choice (Mazursky and Vinitzky, 2015)</li> </ul>	<ul style="list-style-type: none"> <li>• Must balance use of skill and ease of navigating the VW (Domina et al., 2012)</li> </ul>	<ul style="list-style-type: none"> <li>• Must balance use of skill and ease of navigating the VW (Domina et al., 2012)</li> <li>• Little is known about this VR application</li> </ul>
<i>Gaps and Conflicts in the Literature</i>	<p>Gaps:</p> <ul style="list-style-type: none"> <li>• Research in CAVEs</li> <li>• Emphasis on user perspective and update rate despite limited research</li> <li>• Factors outside of feature quality and the impact on immersion</li> <li>• Varying sensory modalities (e.g. haptic and olfactory)</li> <li>• Fantasy VEs</li> <li>• Application quality and emotions</li> <li>• The role of the self, or layers of self) in VE</li> <li>• Interactivity</li> <li>• Co-creation activities</li> <li>• Future Studies</li> </ul>	<p>Gaps:</p> <ul style="list-style-type: none"> <li>• Interactivity within realistic (vs. fantasy) VEs</li> <li>• Interaction of realistic features</li> <li>• Connectivity in VE, and realism</li> <li>• VR application type (e.g. magic mirrors vs. use simulation, etc.)</li> <li>• Assumption that avatar research in others Qs transfer to QII</li> <li>• Product and Concept Development</li> </ul> <p>Conflicts:</p> <ul style="list-style-type: none"> <li>• Realism and generalizability</li> <li>• Emotional intensity and engagement</li> </ul>	<p>Gaps:</p> <ul style="list-style-type: none"> <li>• Feature Quality</li> <li>• Avatars and the self-concept</li> <li>• Relationship between virtual advisors and consumers</li> <li>• Influencers</li> <li>• Source Effects and Avatars</li> <li>• SERVQUAL in VWs</li> <li>• Social Connectivity and Purchases</li> <li>• Co-Creation</li> <li>• Realistic vs. Fantasy VWs</li> <li>• Future Studies</li> </ul> <p>Conflicts:</p> <ul style="list-style-type: none"> <li>• 2D vs. 3D online vs. offline trust</li> <li>• Telepresence increases equity, but VWs decrease brand equity</li> <li>• Realism of social experiences</li> </ul>	<p>Gaps:</p> <ul style="list-style-type: none"> <li>• Research in QIV</li> <li>• Gamification</li> <li>• Interactivity of Game Attributes</li> <li>• Realism vs. Fantasy in games</li> <li>• Avatar-player relationships</li> <li>• Assumption that avatar research in others Qs transfer to QIV</li> </ul>

**Table 4. Research Questions Proposed by Quadrant**

<b>Quadrant</b>	<b><i>Methodological Questions</i></b>	<b><i>Future Studies Questions</i></b>	<b><i>Consumer Behavior Questions</i></b>
<b>QI. AVEs</b>	<ul style="list-style-type: none"> <li>• How does telepresence affect research effectiveness?</li> <li>• How can AVEs test telepresence in more reliable ways?</li> <li>• Given that sensory incongruence can disrupt flow, how do external sensory factors influence AVE-based experiments compared to traditional experiments?</li> <li>• How do emotional experiences interact with immersive features and impact telepresence, given varying emotions and immersive features?</li> <li>• Does actual vs. ideal portrayal of the self in AVEs influence telepresence and attitudes?</li> <li>• How does the use of fantastical (vs. real) scenes affect the ecological validity of studies in AVEs?</li> <li>• Do HMDs and CAVes differ in their viability for research and produce consistent findings?</li> </ul>	<ul style="list-style-type: none"> <li>• How can AVEs anticipate the needs of consumers in the future, ascertain consumer learning, and foresee potential issues?</li> <li>• How can the integration of 3D holographic images of people change the communication landscape, especially for the younger generation?</li> <li>• How do individuals respond to superior AI (e.g. emotionally, behaviorally)?</li> <li>• What are the potential misuses and abuses of new technologies (e.g. driverless vehicles, face recognition software)?</li> <li>• How can technology (e.g. automatic language translation) influence communication and human interactions?</li> <li>• How does telepresence in new environments change the desire for real world existence and alter perceptions of real locations?</li> <li>• How do relations with automated personalities and robots reflect human patterns?</li> <li>• How will AI affect human relationships?</li> <li>• What rights should robots be afforded?</li> </ul>	<ul style="list-style-type: none"> <li>• Beyond cognitive style, embodiment, emotional engineering, body image, and variety seeking, what theories can be advanced using AVEs?</li> <li>• How can AVEs enhance retailing and services research through examinations of touch, eye gaze, and body position?</li> <li>• What is the role of sensory marketing in AVEs in decision-making?</li> <li>• How can co-creation through concept and product design enhance consumer relationships?</li> <li>• How can retailers effectively design virtual store offerings?</li> </ul>
<b>QII. Simulations</b>	<ul style="list-style-type: none"> <li>• Which factors contribute to the realism of a simulation?</li> <li>• How does audience behavior affect realism?</li> <li>• What is the role of simulations in eliciting telepresence and diagnosticity for diagnosticity vs. product or concept development?</li> <li>• Does avatar research with simulations complement that of AVEs?</li> <li>• If avatar use is dependent on user goals (i.e. ideal vs. actual self), how does design of the avatar (realistic vs. not) influence realism?</li> </ul>	<ul style="list-style-type: none"> <li>• How can simulations be used to understand the human brain?</li> <li>• How can the effectiveness of new drugs be tested in simulations, given that simulations can mimic human body responses?</li> <li>• How can improvements in manufacturing and medical treatments influence job training and practice?</li> </ul>	<ul style="list-style-type: none"> <li>• How does interactivity in realistic (vs. non-realistic) environments inform brand evaluations?</li> <li>• How do others in the VE affect actions and perception?</li> <li>• How can simulations foster co-creation efforts?</li> <li>• How might others promote creative thinking (i.e. novel problem-solving scenarios)?</li> <li>• What effect does sensory information have in value co-creation within simulations?</li> <li>• How might individual differences (i.e., construal level, self-discrepancy) predict behavior?</li> <li>• How does product type influence enjoyment?</li> <li>• How are product simulations (e.g. 360 view vs. magic mirror vs. use simulations) influenced by tangibility, telepresence, and value perceptions?</li> <li>• How does avatar perspective influence product evaluations?</li> </ul>



<b>QIII. VWs</b>	<ul style="list-style-type: none"> <li>• How can VWs be implemented to study common marketing issues in new and more realistic ways (i.e. reactions to crowding, emergency situations, process improvement)?</li> <li>• What issues should problem solving challenges address in VWs?</li> <li>• How should results and activities be measured (i.e. through motion tracking vs. qualitatively)?</li> <li>• Are the effects of community more observable in certain VWs over others?</li> <li>• What types of criteria should be used to create flow states depending on the type of VW?</li> </ul>	<ul style="list-style-type: none"> <li>• How can the lack of physical boundaries in VWs enable investigations into social consumption, community interactions, and societal issues?</li> <li>• Can VWs help conceptualize future products?</li> <li>• Are VWs effective for testing yet-unexperienced scenarios (e.g. what would happen if high speed jets could make transcontinental travel easier?)?</li> <li>• What effect will a bimodal society have on behaviors toward others?</li> <li>• What effect will mass society working from home in VR have on lifestyle and consumption?</li> <li>• What effect will falling death rates have healthcare costs, housing systems, the economy in general, and more?</li> <li>• How can artificial intelligence change classroom instruction and the demand for education?</li> <li>• What will the effect of global, ubiquitous surveillance have on privacy concerns?</li> <li>• How will advances in technology and job automation influence poverty, war, and disease?</li> <li>• How will merging of the SWs in developing a metaverse shape how individuals experience the real vs. virtual world?</li> </ul>	<ul style="list-style-type: none"> <li>• How should brands use VWs?</li> <li>• How can co-creation in VWs maintain hedonic experiences and emphasize community?</li> <li>• Does emergent nature produce more creative solutions in VWs as it does in the real world?</li> <li>• How can realistic (vs. fantasy) VWs be used to engage consumer co-creation energies?</li> <li>• How can virtual advisors build relationships?</li> <li>• Which factors influence advisor effectiveness when VWs are more fantasy (vs. real) or emergent (vs. progressive)?</li> <li>• Does relationship marketing apply in VWs?</li> <li>• How does the avatar (self-identity) affect credibility?</li> <li>• How can source effects be used to explain VW source credibility aside from trust?</li> </ul>	<ul style="list-style-type: none"> <li>• Do avatars' possessions serve as an extension of the real self?</li> <li>• To what degree do virtual objects become part of the extension of the self?</li> <li>• What influence does community and sociality of the VW have on purchasing?</li> <li>• How do interactions affect trust?</li> <li>• How can the community build trust and brand equity?</li> <li>• What role should other avatars/users play in v-WOM, including influence?</li> <li>• Can businesses use influencers to promote co-creation?</li> <li>• If virtual consumption practices make VR seem less virtual and more "real," what are the implications for blurring of both worlds?</li> <li>• How does community affect VW shopping?</li> </ul>
<b>QIV. Game Simulations</b>	<ul style="list-style-type: none"> <li>• How can flow occur in low immersion?</li> <li>• How can fantasy and avatar selection be tailored to improve flow?</li> <li>• How do sources of immersion differ based on consumer motivations?</li> <li>• Based on motivational differences across VR types, how do avatar relationships transfer to other types of VR?</li> <li>• Can gamification improve ecological validity, involvement, and behavioral metrics to test new products and identify ease of technological or product adoption?</li> </ul>	<ul style="list-style-type: none"> <li>• How can gamification of future predictions be used to understand individual behavior?</li> </ul>	<ul style="list-style-type: none"> <li>• How do brand-created games affect brand attitudes, reputation, and personality?</li> <li>• Which game factors are most interactive and influential on brand attitudes?</li> <li>• How does the fantasy of brand ownership vs. the desire to experience fantasy influence brand placement attitudes?</li> <li>• Is in-game advertising subtle enough to overcome dislike for brand placement?</li> </ul>	